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ABSTRACT

This report is the first in a series of publications emanating from a four year research effort designed to further knowledge of admissions testing and handicapped people. The report is divided into three major sections describing (1) the development of the research program, (2) a context for conducting that research, and (3) major research issues and activities for addressing those issues. The history of the research program is linked to Section 504 of the Rehabilitation Act of 1973 and a study by the National Research Council, which recommended a substantial research program. The present program is a response to that recommendation. The context for research on admissions testing presented in the paper concerns the definition of handicapping conditions and the characteristics of handicapped people. That the characteristics of handicapped people differ in significant ways from those of the general population raises important issues for admissions testing, such as the extent to which disabled individuals currently have access the admissions testing process; the fairness of test content to handicapped examinees; the extent to which admissions tests equivalently predict academic success for handicapped and nondisabled populations; and whether the preadmission identification, or flagging of scores emanating from modified tests, can be avoided. (Author/BW)

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A RESEARCH CONTEXT FOR STUDYING ADMISSIONS TESTS AND HANDICAPPED POPULATIONS

Randy Elliot Bennett
and
Marjorie Ragosta

August 1984

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Report No. 1
Studies of Admissions Testing and Handicapped People
A Project Sponsored by

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Studies of Admissions Testing and Handicapped People

Most admissions testing programs have long made accommodations for handicapped examinees, though practices have varied across programs and limited research has been undertaken to evaluate such test modifications. Regulations under Section 504 of the Rehabilitation Act of 1973 impose new requirements on institutional users, and indirectly on admissions test sponsors and developers, in order to protect the rights of handicapped persons. The Regulations have not been strictly enforced since many have argued that they conflict with present technical capabilities of test developers. In 1982, a Panel appointed by the National Research Council released a detailed report and recommendations calling for research on the validity and comparability of scores for handicapped persons.

Due to a shared concern for these issues, College Board, Educational Testing Service, and Graduate Record Examinations Board initiated a series of studies in June 1983. The primary objectives are:

To develop an improved base of information concerning the testing of handicapped populations.

To evaluate and improve wherever possible the accuracy of assessment for handicapped persons, especially test scaling and predictive validity.

To evaluate and enhance wherever possible the fairness and comparability of tests for handicapped and nonhandicapped examinees.

This is one of a series of reports on the project, which will continue through 1986.

ETS Research Report RR-84-31

A Research Context for Studying Admissions Tests and Handicapped Populations

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and

Marjorie Ragosta

Educational Testing Service

Princeton, NJ 08541

August 1984

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Abstract

This report is the first in a series of publications emanating from a four year research effort designed to further knowledge of admissions testing and handicapped people. The report is divided into three major sections describing (1) the development of the research program, (2) a context for conducting that research, and (3) major research issues and activities for addressing those issues.

The history of the research program is linked to Section 504 of the Rehabilitation Act of 1973 which contains several mandates affecting college and graduate admissions testing. Because of conflicts between these mandates and current measurement technology, the regulations have not yet been fully enforced. To resolve the conflicts preventing full implementation of Section 504, the U. S. Office of Civil Rights in 1979 commissioned a study by the National Research Council (NRC). The resulting NRC report recommended a substantial research program including studies of test validity, research on the types of test modifications most appropriate for people with various handicapping conditions, and investigations into the role of test scores in decision making. The present program is a response to that recommendation.

The context for research on admissions testing presented in the paper concerns the definition of handicapping conditions and the characteristics of handicapped people. A precise description of the characteristics of those with handicapping conditions should suggest research questions, particular methods of study, and sensible interpretations of results.

Unfortunately, some handicapping conditions (e.g., learning disability) cannot be precisely described. Problems in describing handicapping conditions stem from difficulties in current legal and conceptual definitions, the structure and implementation of diagnostic assessment, and the conduct of special education research.

Despite the problems that hinder precise description of the characteristics of handicapped people, information relevant to research on admissions testing is available. For example, those most commonly taking college and graduate admissions tests include students with learning disabilities, hearing problems, visual impairments, and physical handicaps. These groups tend to differ significantly from the general population on dimensions important to admissions testing (e.g., language proficiency for deaf students and sensory capabilities for those with visual impairment). In addition, the groups differ appreciably among themselves on these dimensions.

That the characteristics of handicapped people differ in significant ways from those of the general population raises important issues for admissions testing. Among these issues are the extent to which disabled individuals currently have access to the admissions testing process; the fairness of test content to handicapped examinees; the extent to which admissions tests equivalently predict academic success for handicapped and nondisabled populations; and whether the preadmission identification, or flagging of scores emanating from modified tests, can be avoided.

Each of these testing issues is addressed in the current research program. Among the program's activities will be a survey of handicapped candidates taking special administrations; item and factor analysis studies to evaluate the fairness of test content; intra- and cross-institutional investigations of predictive validity; and an analysis of a scaling technique purported to obviate the need for flagging scores from modified test administrations.

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Introduction

Public awareness of the problems experienced by handicapped individuals in our society has grown significantly over the past two decades. The most dramatic evidence of this rise in awareness has been the increase in successful litigation and the enactment of federal legislation designed to guarantee handicapped people the basic civil rights that most other citizens have taken for granted.

Of the many important litigious and legislative actions that have marked the past two decades, one of the most significant is Public Law 93-112, the Rehabilitation Act of 1973. The Act's most widely quoted provision, Section 504, states that "no otherwise qualified individual shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance" (Department of Health, Education and Welfare, 1977a, p. 22676). As such, Section 504 represents the cornerstone of civil rights legislation for handicapped people and a national commitment to fully involving them in American society.

Published in 1977, the section's administrative regulations contain mandates that provide a wide range of protections to handicapped people in education and employment. Several of these mandates directly affect college and graduate admissions testing. Areas addressed include access to test administrations, the validity of instruments, and, indirectly, the reporting of scores. Due in part to inconsistencies between these mandates and the state-of-the-art in educational measurement, important

aspects of the regulations have not yet been enforced.

Significant Issues Related to the 504 Regulations

The issues posed by Section 504 for college and graduate admissions testing primarily concern test validity and score reporting. With respect to test validity, the regulations state that an institution subject to the Act may not make use of any test or criterion for admission that has a disproportionate, adverse effect on handicapped persons (Department of Health, Education, and Welfare, 1977a, Section 84.42b2). A test with adverse impact can be used given that the test has been validated as a predictor of success in the education program in question or if other criteria having less adverse effect are not shown to be available. The burden for identifying other criteria is left with the Director of the Office of Civil Rights.

From all available data, admissions tests do have the potential to adversely impact some groups of handicapped people; the average admissions test scores of handicapped examinees are typically lower than those of nonhandicapped applicants (Jones & Ragosta, 1982; Maxey & Levitz, 1980; Ragosta & Nemceff, 1982). As the law and the professional literature recognize, adverse impact does not necessarily constitute unfair measurement (Cleary, Humphreys, Kendrick, & Wesman, 1975; Flaugher, 1978). Differences in group performance on admissions tests may reflect true differences in developed abilities necessary for success in higher education. The extent to which such a relationship exists is a question of test validity.

Though a multitude of data supports the validity of

admissions tests, such as the Scholastic Aptitude Test (SAT) and the Graduate Record Examinations (GRE), for predicting the general population's success in college and graduate school (Ford & Campos, 1977; Schrader, 1971; Willingham, 1974; Willingham, Breland, & Associates, 1977), little data on the validity of these tests with handicapped examinees is available. Hence, the degree to which admissions tests fairly represent the developed academic abilities of handicapped individuals is not known.

The primary technical problem that has impeded the conduct of validity studies has been the limited numbers of handicapped examinees taking admissions tests (Maxey & Levitz, 1980; Winterbottom & Angoff, 1980). Because the needs of handicapped examinees vary widely, a range of accommodations are made in the admissions testing process. These accommodations include braille, large type, and cassette formats, the use of readers and recorders, and extra time (Educational Testing Service, 1982).[1] As the number of students with a specific handicap taking a particular special accomodation is generally very small, studies of the validity of the various special test formats have rarely been practical.

Section 504 also requires that tests be selected and administered so as to best ensure that results reflect the handicapped applicant's "aptitude or achievement level or whatever other factor the test purports to measure, rather than reflecting the applicant's impaired sensory, manual, or speaking skills (except where those skills are the factors that the test purports to measure)" (Department of Health, Education, and Welfare, 1977a, p. 22680-22681, Section 84.42b3). Atttempts to

comply with this requirement have typically taken the form of modifying the conditions and/or content of testing (e.g., administering the test in braille and eliminating items utilizing graphical material). Given that such modifications do not eliminate the assessment of elements important to success in the college or graduate program, changes in test content and administrative conditions are defensible.

While allowing handicapped examinees to more easily participate in the admissions testing process, the modification of tests may have negative effects. For one, modifications may result in a measure that is substantially different from that normally given. The test may be so unlike the original in administrative conditions or content as to measure different constructs, rendering interpretations normally ascribed to the results of unmodified tests inapplicable and meaningful comparisons to students taking standard administrations impossible. Hence, the meaning of the scores both with respect to others taking the test and to the criterion of college success becomes clouded, an effect presumably at odds with the intent of the 504 Reglations.

Also related to issues of test validity are the implications of the 504 Regulations for score reporting. Because the scores from modified administrations may not warrant the inferences made from standard administrations, these scores are reported with a "NON STD" notation. The notation is meant to alert admissions officers to the fact that the usual interpretive guidelines do not apply and the scores may therefore not accurately represent

the handicapped examinee's capabilities. The result of the notation is, of course, to identify the examinee as handicapped, an effect in direct conflict with the Section 504 Regulations which prohibit institutions from making preadmission inquiry about whether a person is handicapped (Department of Health, Education, and Welfare, 1977a, Section 84.42b4).

The tension between the Section 504 ban on preadmission inquiry and the need to alert admissions officers to the interpretive problems associated with scores obtained under nonstandard conditions was temporarily resolved by a set of OCR-endorsed guidelines for the admission of handicapped students (Redden, Levering, DiQuinzio, & the Task Force on a Model Admissions Policy, 1978). These guidelines, prepared by a joint committee of the American Association of Collegiate Registrars and Admissions Officers (AACRAO) and the American Council on Education (ACE), permit the flagging of scores from modified tests on an interim basis.

The AACRAO/ACE guidelines were meant to allow time for careful exploration of the issues necessitating flagging, in particular those related to test validity. Recognizing the need to clarify the issues preventing full implementation of the testing provisions of Section 504, the Office of Civil Rights commissioned a study of the problem by the National Research Council (NRC).

The NRC Panel Report

The NRC Panel on Testing of Handicapped People was established in 1979 to study the psychometric, social, legal, economic, and ethical issues surrounding the use of standardized

tests with handicapped people, especially for purposes of postsecondary admissions. The panel was given the task of reconciling the testing mandates of the 504 regulations with current measurement technology and practice (Sherman & Robinson, 1982, p. vii). The Panel's report included chapters on admissions testing for post-secondary education, the legal context of Section 504, psychometric requirements of the regulations, recommended research, and recommended policies and procedures.

In its key recommendations, the Panel called for a substantial research program. Cited as major components of this program were studies of test validity, research on the types of test modifications most appropriate for people with various handicapping conditions, and investigations into the role of test scores in decision making.

The Research Program

In response to the NRC Panel's report, ETS and two of the major sponsors of admissions tests (the College Board and the Graduate Record Examinations Board), have undertaken a four-year research program designed to (a) respond to issues raised by Section 504 and the NRC Panel, and (b) ensure that the testing experience and scores on tests administered by ETS to handicapped individuals are as comparable as possible to those of nonhandicapped examinees. In line with this dual purpose, three research and development objectives have been set.

The first of these objectives is to develop an improved base of information and test data concerning the characteristics of

handicapped populations. Information on the characteristics of handicapped people helps provide a basis for posing research questions, interpreting research results, and suggesting sensible modifications in test content and administrative conditions. One of the activities undertaken to satisfy the program's first objective will, therefore, be to produce background papers on the research context surrounding admissions testing and handicapped students--the present paper--and on the typical test performance of these individuals and psychometric characteristics of tests used in assessing their skills and abilities (Bennett, Ragosta, & Stricker, 1984).

While background information offers a context for viewing and acting upon research results, the results themselves must be generated from raw data on handicapped test takers. The small numbers of handicapped individuals participating in testing programs necessitates a mechanism for routinely saving and utilizing these data. Constructing such a mechanism will constitute another primary activity under the program's first objective.

The second objective of the program is to evaluate and improve, wherever possible, the accuracy of assessment for handicapped people, especially the predictive validity and scaling of nonstandard versions of tests. Several sets of studies are planned to satisfy this objective. A series of institutional validity studies will provide information on variations in predictive validity between handicapped and nonhandicapped groups and among different educational programs. A set of aggregated validity studies will attempt to determine the

extent to which validity findings can be generalized across institutions. This latter series of investigations will apply a recently-developed Bayesian statistical methodology (Braun & Jones, 1980) to the small sample problem that has typically impeded psychometric research with handicapped populations. Finally, an examination of the possibility of scaling the scores from nonstandard tests through criterion measures, such as freshman grade point average, will be undertaken.

The program's third and final objective is to evaluate and enhance, wherever possible, the fairness and comparability of tests for handicapped and nonhandicapped examinees, especially with respect to test content and the conditions of administration. This objective entails contact with handicapped examinees to study their perceptions of the testing process so that inappropriate conditions can be identified and corrected. It also involves examination of the internal structure of tests to determine whether tests function equivalently in different populations. Finally, the performance of individual items will be examined to identify content that is unfair to handicapped test takers.

Given these objectives, the College Board/ETS/GRE Board research program should add significantly to our knowledge of testing handicapped people, providing useful information to policy makers, test developers, and handicapped people alike. As an informational program, however, it will serve to enlighten, rather than set, testing policy. In addition, it may not be capable of solving assessment problems for which effective

measurement technology simply does not exist.

A Research Context

To provide a basis for understanding the problems inherent in testing handicapped examinees, background information on (a) the issues involved in defining handicapping conditions and (b) the characteristics of handicapped people is discussed in this section.

Who are the Handicapped?

Questions of definition are central to the investigation of any population. A clear description of the psychological, physical, social, and demographic characteristics of the population may suggest important research questions, imply particular methods of study, and provide a context for interpreting research results. In addition, precise description permits others to explore the same questions with members of the population to see if research results can be confirmed.

For purposes of studying admissions testing and handicapped people, definition takes on special importance. For one, the nature of the handicapping condition plays a large role in suggesting critical research questions. For example, if as some believe, learning disability (LD) entails a perceptual disorder, might estimates of the LD student's verbal abilities be distorted by mistakes in recording responses on machine-scorable answer sheets? In the same way, might the characteristic language deficiencies of deaf pupils unfairly lower estimates of mathematics ability generated through word problems?

In addition to suggesting research questions, the nature of the handicap also implies particular research methods. For

instance, it is known that the physically handicapped population is composed of several subgroups with different psychoeducational characteristics (Sattler, 1974). Research designs should reflect the existence of these subgroups rather than treating the physically handicapped population as a single, homogenous entity.

Finally, research results will need to be placed within the context of what is known about different handicapped populations. Research may, for example, identify particular item types as biased against deaf examinees. This information will be most interpretable if the language structures associated with those item types are similar to the structures generally found to be difficult for deaf individuals (e.g., see Rudner, 1978).

While detailed description has critical implications for research on admissions testing and handicapped people, precisely defining the different handicapping conditions has generally proved a difficult task. Problems in describing handicapping conditions have resulted from several sources including the definitions themselves, the structure and implementation of diagnostic assessment, and the conduct of special education research.

Definitions. The definition of handicap that has the most relevance for admissions testing is contained in the regulations for Section 504. This definition states that a handicapped individual is "any person who (i) has a physical or mental impairment which substantially limits one or more major life activities, (ii) has a record of such impairment, or (iii) is regarded as having such an impairment" (Department of Health,

Education, and Welfare, 1977a, p. 22678, Section 83.3j). The definition goes on to define major life activities as "caring for one's self, performing manual tasks, walking, seeing, hearing, speaking, breathing, learning, and working," and lists the various body systems that, when in disorder, constitute impairment (p. 22678, Section 83.3j2ii).

Who are those with impairments that substantially limit the major life activity of, for example, hearing? The answer is complicated by the fact that definitions of deafness vary considerably. The Conference of Executives of American Schools for the Deaf defines the deaf person as one whose hearing ability precludes sucessful processing of linguistic information through audition, with or without a hearing aid (Report of the Ad Hoc Committee to Define Deaf and Hard of Hearing, 1975). Davis (1970), on the other hand, considers the disorder to manifest itself in those with hearing loss greater than 93 decibels. A third definition is offered by the NRC Panel on Testing of Handicapped People, which uses a 70 decibel threshold as indicative of deafness (Sherman & Robinson, 1982, p. 10). Finally, Hallahan and Kauffman (1978, p. 282) note that the impairment can be defined as a hearing loss suffered in the first two or three years of life that precludes the natural acquisition of language.

A second illustration of the problems existing with respect to definition concerns those with impairments that substantially limit the major life activity of learning. What individuals constitute this group? The largest single population taking admissions tests in this category are those with learning

disabilities (Ragosta & Nemceff, 1982). The most widely accepted definition of this disorder is contained in Public Law 94-142, the Education for All Handicapped Children Act of 1975 (Department of Health, Education, and Welfare, 1977b, Section 121.5b9). The Act defines learning disability as:

> a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written languages. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling, or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, etc. They do not include learning problems which are due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbance, or to environmental disadvantage.
>
> (p. 42478)

Through its regulations, PL 94-142 offers an operational definition of the disorder (Department of Health, Education, and Welfare, 1977c, Section 121a.541). This definition characterizes learning disability as an ability-achievement discrepancy, existing in spite of the provision of age-appropriate instruction, that is not primarily caused by other conditions. Both the constitutive and operational definitions offered by the Act serve as bases for education code and administrative procedure in the states.

The federal definitions of learning disability have been the subjects of considerable controversy. For example, it has been noted that the disorders that define learning disability are at least as ill-conceived as the parent term. Minimal brain dysfunction, perceptual handicap, and dyslexia all refer to conditions whose etiology, symptoms, prevalence, and treatment

are uncertain (Reid & Hresko, 1981, p. 229-230).

A second element of concern is the requirement that the ability-achievement discrepancy not be the result of other factors such as mental retardation, emotional disturbance, economic disadvantage, or sensory or physical impairment. This requirement presumes that the causes of learning failure can be reliably differentiated. Though significant advances in testing have been made (e.g., Ahn, Prichep, John, Baird, Trepetin, & Kaye, 1980), the fact remains that no technology exists that can dependably unwind the myriad causes of school failure (Bennett, 1981a; Reid & Hresko, 1981, p. 9).

Finally, the operational definition of learning disability is squarely built upon the construct of underachievement, as indicated by the ability-achievement discrepancy. The concept of underachievement, while seductively simple, is severely flawed (Thorndike, 1963). First the concept assumes that potential can be accurately measured. What one is capable of achieving, however, cannot be known with any certainty until it has been accomplished. Tests can only predict future achievement from which potential is inferred. When predicted and actual achievement differ, it often makes as much sense to call tested performance an overprediction as it does to label the student an underachiever.

Second, the concept of underachievement is beset by problems of measurement reliability (McLeod, 1979; Thorndike, 1963). The difference between two test scores is almost always less reliable than either score alone. The result is that diagnoses based on

ability--achievement discrepancy are tenuous presumptions at best.

Last, intra-individual discrepancy does not appear to be a phenomenon peculiar to learning disability. Discrepancies can indicate a lack of motivation, absence from school, or simply normal variation (Shepard, 1982). In fact, intra-individual discrepancies appear to exist as frequently among children classified as sensory impaired and behavior disordered as among those with learning disability (O'Donnell, 1980).

Because current federal definitions of learning disability give little practical guidance as to what learning disability is, some 40 competing definitions have been suggested (Ysseldyke, 1983). The breadth of characteristics encompassed by these definitions is so great that a recent study of 17 such definitions found 85% of a normal student sample classifiable as learning disabled (Ysseldyke, Algozzine, & Epps, 1983).

Structure and Implementation of Assessment. The structure and implementation of the special education classification and placement process has also hampered accurate description of students with handicapping conditions. Typically, students enter the process as a result of being referred by their classroom teachers. Research has shown teacher referrals to be often based on such extraneous factors as race, sex, physical appearance and socioeconomic status, as opposed to the pupil's need for special services (Ross & Salvia, 1975; Stevens, 1981; Tobias, Cole, Zibrin, & Bodlakova, 1982). The result of this biasing effect is to introduce children with no readily identifiable handicapping condition into the pool of students being considered for special education placement.

By federal law, those entered into the referral pool are assessed by a team of professionals. The information gathered by this team is meant to form the basis of subsequent classification and placement decisions. Research on the assessment process has suggested that child study professionals frequently lack critical evaluation competencies. Proficiencies lacked include skill in selecting, administering, and interpreting instruments and in recognizing normal variability in children (Bennett, 1981b; Bennett & Shepherd, 1982; Davis & Shepard, in press; Keogh, Kukic, Becker, McLoughlin, & Kukic, 1975; Miller & Chansky, 1972; Miller, Chansky, & Gredler, 1970; Shepard, 1983; Thurlow & Ysseldyke, 1979; Warren & Brown, 1973; Ysseldyke, Algozzine, Regan, & Potter, 1980).

Assessment is followed by a classification meeting at which a diagnosis is made. Investigations of this aspect of the process report little consistency in diagnostic statements among professionals assigned to the same case, only a slight relationship between assessment data and team judgments, and the influence of irrelevant pupil characteristics on classification decisions (Mercer, 1973; Vinsonhaler, Weinshank, Wagner, & Polin, 1983; Ysseldyke, Algozzine, Richey, & Graden, 1982; Ysseldyke, Algozzine, & Thurlow, 1980). As a result, studies suggest that over half of the classification decisions made by child study teams are erroneous (Algozzine & Ysseldyke, 1981; Craig, Myers, & Wujek, 1982; Shepard, Smith, & Vojir, 1983). The effect of these placement errors is to further confuse attempts to characterize the true nature of handicapping conditions.

Research Results. The intent of educational and psychological research is usually to clarify the nature of some phenomenon. Unfortunately, a good deal of the research on handicapping conditions has had the opposite effect. One reason for this unintended consequence is the poor quality that sometimes characterizes special education research (Applebee, 1971; Cohen, 1976; Torgesen & Dice, 1980).

Perhaps the best illustration of the confounding effect of poor research on the understanding of handicapping conditions exists with respect to sample selection. Researchers interested in learning disability have often selected study samples on the basis of placement in school district LD programs. Because many of the students in these programs are known to be misdiagnosed, results derived from studying these samples offer a distorted picture of the basic nature of learning disability (Keogh, 1983; Shepard, 1982; Shepard, Smith, & Vojir, 1983).

A second criticism of special education research has been the use of pre-experimental designs (Torgesen & Dice, 1980). Such designs as the "one-shot case study" and the "one group pretest-posttest design" fail to control for the influence of extraneous variables (e.g., normal pupil growth, other instructional programs) upon the performance of those being studied (Campbell & Stanley, 1963). Hence, the conclusions that can be drawn from these studies about the basic nature of handicapping conditions are limited at best.

Last, special education research has been cited for its widespread use of questionable dependent measures (Torgesen &

Dice, 1980). Many investigators have reported the results of their work with handicapped students in terms of tests or experimental tasks for which no validity data exist. Because the meaning of these measures is unclear, characterizations of handicapped pupils in terms of these measures must be suspect.

In summary, several factors have hindered attempts to describe the basic nature of handicapping conditions. Among these factors are unclear definitions, an oftentimes inaccurate classification and placement process, and the limitations of past research. In combination, these factors have led to confusion and disagreement about the defining characteristics of handicapping conditions. Recognizing these difficulties, we discuss what is known about the characteristics of handicapped individuals to provide a basis for suggesting important research questions, methods of study, and plausible interpretations of results.

What are the Characteristics of People with Handicapping Conditions

Because of significant differences among subgroups, those with handicapping conditions are not typically treated as a single entity. Still, some meaningful statements can be made about the population as a whole.

For the 1982-83 school year, 4,285,606 students were classified as handicapped by the nation's schools (National Association of State Directors of Special Education, 1983, p. 2). This figure represented 10.67% of the total public school enrollment of 40,168,000. The overwhelming majority of handicapped students (85%) fell into three categories: learning

disability (41%), speech impairment (26%), and mental retardation (18%).

In the same school year, 6,104 students of the approximately 1.5 million tested, requested special administrations of the Scholastic Aptitude Test (SAT) (Centra, 1983). Another 437 of the roughly 300,000 tested requested nonstandard administrations of the Graduate Record Examination (GRE) General Test (Wild, 1982). The majority of those requesting SAT special administrations, 4,356 students, indicated a learning disability, with 1,015 reporting a visual impairment, 467 a physical handicap, and 266 a hearing problem.

In 1978, the only year for which data appear available, just over 50,000 handicapped freshmen were enrolled in college (Lawrence, Kent, & Henson, 1981). This figure represented approximately 3% of the total freshmen enrollment of 1.7 million. The total number of handicapped people attending college is not known (Hartman, 1983).

Though over 50,000 handicapped freshmen enrolled in college in 1978, there is general agreement that handicapped people are underrepresented compared with the 18 to 25 year old population at large (Department of Education, 1980, cited in Sherman & Robinson, 1982, p.39; President's Committee on Employment of the Handicapped, undated, p.1). In addition, those who do go to college are more likely to enroll in two-year institutions than are their nondisabled peers (Lawrence, Kent, & Henson, 1981; AACRAO/College Board, 1980). The reasons for underrepresentation of handicapped people in college generally and in four-year

institutions in particular are not known. Conceivably some amount of underrepresentation is due to a greater percentage of unqualified individuals in the handicapped population (e.g., about 18% of school-age handicapped are mentally retarded and presumably unprepared for college study). Other factors may include the level of interest in attending college among handicapped students, the lack of specialized programs to help the more severely disabled pupil succeed, and the tendency of state rehabilitation agencies to encourage enrollment in two-year institutions. The role that admissions tests play in causing underrepresentation is not clear (Sherman & Robinson, 1982, p. 39-40).

The most comprehensive picture of handicapped college students developed to date is presented in a longitudinal analysis conducted by the Higher Education Research Institute (Lawrence, Kent, & Henson, 1981, 1982; Henson, Kent, & Richardson, 1981). Institute researchers began following a national sample of disabled freshmen entering college in 1978 (Lawrence, Kent, & Henson, 1981). The group was composed of students with the following self-reported handicaps: visual (29%), orthopedic (14%), hearing (7%), multiple (4%), learning (3%), and speech (2%).[2]

Compared to nondisabled freshmen entering college in the same year, disabled students were found to be generally similar in background, attitudes, plans, and expectations. Handicapped college students were more likely to aspire to a doctorate or advanced professional degree, preferred more traditional academic fields (e.g., hard and social sciences, humanities and other

nontechnical majors), and planned on careers as artists, teachers, and research scientists. Disabled freshmen were less likely to have taken an academic program in high school and tended to make somewhat lower grade point averages and high school ranks.

An attempt to revisit the original group of 1978 disabled freshmen was made in 1981 (Lawrence, Kent, & Henson, 1982). Follow-up data were obtained from a very small proportion of the original group (approximately 14%), so results must necessarily be viewed with caution. By 1981, two thirds of the total follow-up group had remained continuously enrolled in college. The remaining third were on temporary leave (15%), had left and returned (10%), or had dropped out (8%).

Results of the follow-up give insight into the effects of handicap on college functioning, need for support services, and predictors of college outcomes, among other things. With respect to college functioning, most students (54%) reported that their disability affected functioning "somewhat." Only 20% of the sample felt that their disability "very much" affected functioning, with the remaining quarter reporting virtually no effect.

Though many in higher education envision handicapped students as placing specialized demands upon institutional resources, most survey respondents said that support services or accomodations for handicapped pupils were not relevant to them. Indeed, the services disabled students found most relevant were those commonly available to the general college community (e.g.,

academic advising, financial aid, clubs).

College outcomes were shown to be significantly related to several student variables. As has been repeatedly found in the general population, college grade point average (GPA) was best predicted by high school GPA. (Admissions test scores were not included in the set of variables used to predict college grades.) Also predictive of college grades were chronological age and age of onset: older students and those whose disabilities had been diagnosed later tended to achieve higher grades. Persistence was positively related to father's educational level and parental income, but negatively related to high school GPA.

Of no small consequence, the follow-up study noted that handicapped college students differed significantly as a function of disability group. This finding, consistent with the categorical organization of the literature on handicapping conditions, suggests the need for separate examination of each of the four major disability groups taking admissions tests.

Learning Disability. Over 1.7 million pupils were classififed as learning disabled by the nation's elementary and secondary schools in the 1982-83 academic year (National Association of State Directors of Special Education, 1983, p. 2). Perhaps the most assured generalization that can be made about this group is that it is heterogenous. In one of the most extensive epidemiological studies of the disorder done to date, Shepard, Smith, and Vojir (1983) detected four major groups composed of 18 distinct subgroups within the population of students served as learning disabled by school districts in Colorado. The major groupings were children with (a) other

handicaps such as mental retardation, emotional disturbance, and hearing disorder; (b) learning problems such as native language interference and slow learner; (c) no dependable assessment data or no detectable learning problem; and (d) learning disabilities.

The learning disabled group identified by Shepard et al. was composed of children falling into eight different empirically-determined subgroups. Membership in each subgroup was based on an analysis of test and other data contained in pupil records. The resulting subgroups were: significant ability/achievement discrepancy (48.1%), medium quality processing deficit and verbal/performance discrepancy (15.5%), high quality processing deficit (11%), weak significant discrepancy and verbal/performance discrepancy (8.5%), medium quality processing deficit only (8.2%), hyperactive (4.7%), weak significant discrepancy and medium quality processing deficit (2.5%), and brain injured (1.4%).

Though Shepard et al.'s work represents a significant step forward in understanding the composition of the LD population, their classification scheme more accurately describes current decision-making practices than the true nature of learning disability. To be sure, with the possible exception of hyperactivity, none of the groups detected by Shepard has been extensively studied. In addition, several other subtype classifications have been posited (e.g., see Boder, 1971; Mattis, French, & Rapin, 1975; McKinney, 1984; Sattler, 1982, p. 396-397). Last, no identified subgroup can be said to possess either sound theoretical underpinnings or a unique set of diagnostic

characteristics.

Though the precise nature and number of subgroups composing the LD population is open to question, the heterogeneity of the population is not. It is, therefore, surprising to discover that the research literature supports several important generalizations about the learning disabled population as a whole. These generalizations relate primarily to physical, cognitive academic, and social characteristics.

Among the most widely reported physical characteristics of learning disabled students are tendencies to be male, caucasian, and have motor anomalies. Demographic studies have repeatedly confirmed the existence of a disproportionate representation of males in LD programs on the order of 3 to 5 males to every female (Kirk & Elkins, 1975; Lerner, 1976; Norman & Zigmond, 1980). This finding should be balanced against the substantial amount of data documenting greater biological vulnerability of males generally and an overall disproportionate representation of males in special education (Heller, Holtzman, & Messick, 1982 p. 26; Shonkoff, 1982).

In addition to being characterized as male, the LD student has been widely pictured as white and middle class (e.g., Shepard, 1982, p. 15). In fact, studies suggest that though black students may be overrepresented in some regions (Tucker, 1980), whites and blacks are properly represented in the LD category nationwide (Finn, 1982). Consistent disproportions have been documented only for the American Indian/Alaskan Native classification, whose members are also overrepresented in LD programs (Finn, 1982).

Motor difficulties in learning disabled children have been frequently reported in the clinical literature (e.g., see Clements, 1966 p. 11-13, cited in Bryan & Bryan, 1975; Johnson & Myklebust, 1967, p. 14). Reported anomalies include clumsiness, lack of body awareness, poor directionality, lack of gross and fine motor coordination, and generally disorganized motor behavior (Reid & Hresko, 1981, p. 83). Though research evidence supports these clinical observations, motor difficulties do not appear to be strongly associated with academic success (Reid & Hresko, 1981, p. 83).

Learning disabled students have also been commonly pictured as hyperactive (e.g., see Clements, 1966 p. 11-13, cited in Bryan & Bryan, 1975). In truth, the relationship between hyperactivity and learning disability is unclear (Bryan & Bryan, 1975, p. 142). There is no evidence to suggest that either learning disabled children are generally hyperactive or that hyperactive children are generally learning disabled (Reid & Hresko, 1981, p. 24).

Besides physical traits, generalizations can be made about the cognitive/academic characteristics of the learning disabled. These generalizations are primarily derived from research conducted with school-age pupils and relate to intelligence and ability structure, cognitive processing, perception, and specific academic difficulties.

Most conceptualizations of learning disability posit average to above-average intelligence as a defining criterion (e.g., see Bryan & Bryan, 1975, p. 89; Johnson & Myklebust, 1967, p. 9; Reid

& Hresko, 1981; p. 4). Research, however, shows the average performance of LD pupils on cognitive ability tests to be somewhat below that of the general population (Bennett, Ragosta, & Stricker, 1984; Kirk & Elkins, 1975; Norman & Zigmond, 1980).

The ability structure of the learning disabled student is described by definition as uneven. That is, the pattern of cognitive abilities evidenced by these individuals is thought to be composed of highs representing skilled performance in some areas and lows denoting deficits in others (e.g. see McCarthy & McCarthy, 1969, p. 7). In fact, the degree of variability shown by LD students in cognitive test subscale and subtest scores, while subtantial, is little different from that evidenced by normal children (Kaufman, 1976a, 1976b, 1981).

Much research has recently been published on the cognitive processing characteristics of the LD population. Among the findings of these studies has been a general failure to use strategic behavior in performing cognitive tasks. LD students may fail to spontaneously use mnemonic strategies such as rehearsal and category clustering when trying to memorize, even though these strategies are available to them (Bauer, 1977; Torver, Hallahan, Kaufman, & Ball, 1976; Freston & Drew, 1974; Parker, Freston, & Drew, 1975). They also lack self-checking behaviors and tend not to be thorough or exhaustive in attacking tasks (Wong, 1982). As a result, some investigators now view the LD student as an inactive learner who lacks a general awareness of the demands of the task, a motivation for seeking a solution, and the cognitive strategies that can be brought to bear upon it (Torgesen, 1977).

In addition to strategic behavior, the perceptual processing capabilities of LD students have been a target of frequent study. Research on this topic is of particular interest because of the widely-held belief that perceptual handicaps underlie the academic deficits associated with learning disability (e.g., Frostig, 1972). Results indicate that LD students do perform more poorly than the general population on a wide variety of auditory and visual perceptual tasks (Kavale, 1981, 1982; Reid & Hresko, 1981, p. 81). Whether such performance causes, is caused by, or is simply a correlate of academic deficits is open to question (Reid & Hresko, 1981, p. 79-83; Vellutino, Steger, Moyer, Harding, & Niles, 1977).

One of the most obvious cognitive characteristics of LD students is their poor academic performance. Most of those identified as learning disabled have reading difficulties (Reid & Hresko, 1981, p. 232). Reading disabled students also tend to evidence problems in spelling, writing, and spoken language (Anderson, 1982; Andolina, 1980; Carpenter & Miller, 1982; Menyuk & Flood, 1981; Poplin, Gray, Larsen, Banikowski, & Mehring, 1980; Semel & Wiig, 1975; Vogel, 1974). These difficulties appear persistent, following the learning disabled individuals into adulthood (Frauenheim, 1978; Horn, O'Donnell, & Vitulano, 1983; Wiig & Fleischmann, 1980).

Aside from physical and cognitive/academic characteristics, a considerable body of research has evolved documenting the social difficulties of LD pupils. Learning disabled students are often reported to be less popular with peers and teachers than

their nondisabled counterparts (Bryan, 1974, 1976; Bryan & Bryan, 1978; Garrett & Crump, 1980; Horowitz, 1981). They are less skilled at initiating and maintaining conversations with peers (Bryan, Donahue, Pearl, & Sturm, 1981), at perceiving nonverbal social cues (Axelrod, 1982, Bryan, 1977), and at adopting alternative viewpoints to put themselves in another's place (Wong & Wong, 1980). As adolescents, LD students may show problems in grooming, neatness of clothing, posture, and general attractiveness (Schumaker, Wildgen, & Sherman, 1982). Their appearance and actions are reportedly so distinctive that strangers (both children and adults) seem able to accurately distinguish them from their nondisabled peers after only a few minutes' observation (Bryan & Sherman, 1980).

Relatively little is known about the LD student in higher education. However, because learning disability is primarily an academic disability (unlike physical handicap or visual impairment), it is reasonable to expect the demands of higher education to cause special problems for this group. Consistent with this presumption are the results of a study of freshmen entering college in 1978 (Lawrence, Kent, & Henson, 1981). The study found that those with learning disabilities distinguished themselves from other handicapped college students by a lack of confidence in their ability to perform at the college level and by less adequate academic preparation (i.e., as indicated by poorer high school records).

Perhaps related to the academic problems of this group is the finding that learning disabled students constitute only three percent of the total handicapped freshman population (Lawrence,

Kent, & Henson, 1981), though they presently represent just under half of the school-age handicapped population. In addition, of those LD students who did enroll in college in 1978, over half attended public two-year colleges.

What causes learning disability? Reid and Hresko (1981, p. 9-13) suggest two general classes of etiology. Organic etiologies include problems related to brain injury (genetic, prenatal, perinatal, postnatal) and biochemical disorders. Among the environmentally-based causes are poor nutrition, lack of early stimulation, and emotional disturbance. As has been noted, no dependable means exists for practically differentiating among these etiologies (Bennett, 1981a; Reid & Hresko, 1981, p. 9).

Of the different etiologies, most authorities posit some subtle neurologically-based anomaly as the cause of learning disability (e.g., McLoughlin & Netick, 1983). Evidence is beginning to emerge suggesting abnormalities in brain physiology, anatomy, and other neurological factors (e.g., Galaburda & Geschwind, 1982). As yet, however, the causal link between neurological integrity and LD is by no means clear and the root causes of the disorder remain controversial (Coles, 1978; Sattler, 1982).

The characteristics of learning disabled students pose important challenges to admissions testing programs. One such challenge is posed by the poor basic skills that appear to typify the LD student. This characteristic makes the accurate assessment of higher level abilities exceedingly difficult. For

instance, underdeveloped reading skills may prevent some LD students from demonstrating superior mathematics reasoning ability when problems are presented in text form. Reading difficulty may additionally hamper the understanding of written test directions. This misunderstanding may result in incorrect performance on groups of items or entire sections of the test.

The obvious solution to the problems posed in assessing the abilities of the LD student is to modify the conditions of testing. While modifications to standard administrative procedure may help, they by no means solve the dilemma. For example, one alternative approach to assessing mathematics reasoning ability is to present problems via cassette tape. Students with learning disabilities, however, are widely reported to have auditory perceptual problems. Given this fact, the resulting scores may represent poor perceptual skills more than math reasoning ability.

Perceptual skills may hamper the accuracy of assessment in still another way. The LD student may accurately solve problems, yet, due to visual-perceptual deficits, mark the wrong boxes on the machine-scorable answer sheet. The result, again, is an invalid assesment of problem-solving ability.

Hearing Disability. Hearing disabilities cover a range of handicapping conditions from total deafness to mild defects correctable by hearing aids. According to Meadow (1980), the assessment of hearing is based on two qualities of sound: loudness and pitch. Loudness, or intensity, is measured in decibels (dB), from zero for the softest audible sound to 120 for sound which is extremely loud and possibly painful. Whispered

speech is about 20 to 30 dB. Conversational speech is 60 to 70 dB. Pitch, or the frequency of sound waves, is measured in Hertz or cycles per second. The frequencies which are most important for understanding speech are in the range of 500, 1,000 and 2,000 Hertz.

Hearing loss may be defined as the unaided, average pure-tone threshold in the better ear at 500, 1,000 and 2,000 Hertz (Karchmer, Milone & Wolk, 1979). As has been stated, disagreement exists on the classification of hearing loss, with different threshold levels used to define loss. Different definitions understandably encompass different numbers of individuals with various distributions of characteristics (Schein & Delk, 1974).

One classification developed by Karchmer, Milone and Wolk (1979) organizes hearing loss in three groups: less than severe ($\leq$70 dB), severe (71 to 90 dB), and profound ($\geq$91 dB). Another categorization of hearing loss in current use is that based on definitions of deaf and hard-of-hearing:

> A deaf person is one whose hearing disability precludes successful processing of linguistic information through audition, with or without a hearing aid.
>
> A hard-of-hearing person is one who, generally with the use of a hearing aid, has residual hearing sufficient to enable successful processing of linguistic information through audition.
>
> (Report of the Ad Hoc Committee to Define Deaf and Hard of Hearing, 1975, p. 509, cited in Hallahan & Kauffman, 1978, p. 283)

Several characteristics of hearing impaired individuals are associated with the degree of hearing loss. Karchmer, Milone and Wolk (1979) noted that students with less-than-severe hearing

loss relied primarily on speech when communicating with parents and teachers. More than 85 percent were rated as having intelligible speech, and almost two-thirds were in mainstreamed, integrated school programs. In contrast, profoundly deaf students relied heavily on manual communication with 80 percent using signs either alone or in combination with speech. Fewer than 25 percent were rated as having intelligible speech, and almost two-thirds were in residential schools for deaf students. Severely impaired pupils characteristically fell between those who were profoundly deaf and those with less-than-severe impairments on these communication and educational placement characteristics.

Poor language development is the outstanding characteristic of hearing impaired children. There is considerable agreement that the greater the hearing loss, the greater the communication problem, both in reception and production of language (Meadow, 1980; Quigley, 1979; Stark, 1979). Without hearing and imitating the sounds of human language, deaf children are slow to acquire communication skills. It is not surprising, then, that children who are prelingually deaf have greater linguistic difficulty than children whose deafness was acquired after some language experience (Meadow, 1980).

First-language learning for deaf children varies widely and is associated with family environment (Meadow, 1980). For deaf children of deaf parents, manual communication tends to be the first language. For deaf children of hearing parents, initial exposure to language is likely to take the form of spoken English. For those exposed to sign language or some simultaneous

combination of signed and spoken English, language development appears to be more normal and subsequent achievement higher than for those exposed only to speech.

Among educators, methods of communication with deaf children have been the subject of continuing controversy (Hallahan & Kauffman, 1978). The two dominant communication methods have been oralism and a combined manual/oral approach. Oralism focuses on lip reading and speech training, while the combined approach also incorporates such communication techniques as sign language and fingerspelling. The use of both manual and oral methods in combination is termed "total communication."

Even with a combined approach to communication, issues remain. There are many systems of sign from which to chose, each having its own advantages and limitations (Bornstein, 1979). American Sign Language (ASL)--once considered a reduced, imprecise, ungrammatical version of English--has recently emerged as a sophisticated linguistic system (Stokoe, 1980) and is the primary mode of communication in the deaf community. Since the system does not parallel English, speech training and reading must be taught using another system. Fingerspelling--the manual alphabet--parallels English but can be used at only 40 percent of the rate of speech. There are a variety of other sign systems which parallel English: a continuum consisting of dialects of ASL at one end (e.g. Ameslan) and contrived systems (e.g. Signed English) at the other. A major difficulty with all such systems is that they must be learned by hearing parents, educators, and others if the ability to communicate generally is to result.

Given that poor language development is the major characteristic of hearing impaired individuals, what can be said about the cognitive skills of hearing-impaired students? Cognitive ability has usually been measured by performance tests since the use of language would confound the measurement of ability with the language deficiences of deaf students. With the use of performance measures and nonverbal instructions, deaf children usually score within the normal range on cognitive ability tests, although their mean scores are somewhat lower than those of hearing children (Anderson & Sisco, 1977; Meadow, 1980; Mindel & Vernon, 1971).

Educational achievement, however, stands in sharp contrast with the findings on intellectual ability. A standardization sample of 7,000 hearing-impaired children from 8-19 years of age was used to develop norms for the 1974 Hearing-Impaired version of the Stanford Achievement Test (Trybus & Karchmer, 1977). The median performance of hearing-impaired eighteen-year-olds on reading comprehension ranged from third to fourth-grade level in terms of the standard test norms. For mathematics computation, median performance was close to seventh-grade level. While the performance of less-than-severely deaf pupils on reading comprehension consistently averaged between one-half and one grade level higher than their profoundly or severely deaf peers, much less difference was observed among the three groups on mathematics computation (Karchmer, Milone & Wolk, 1979).

In addition to deficits in language development and school achievement, deaf students are characterized by slow social development. Lack of communication or delayed language

acquisition reduces opportunities for social interaction and can result in considerable isolation (Freeman, 1979; Meadow, 1980). Factors associated with social development include family as well as educational environment. Hearing mothers may often fail to give their deaf children the freedom and independence needed to develop social maturity (Meadow, 1980). The deaf children of deaf parents, in contrast, are reported to be relatively more socially mature. Likewise, deaf children in mainstream educational environments are reported as more socially developed than those attending residential schools.

The prevalence of emotional/behavioral problems in deaf children is said to be significantly higher than in hearing children (Meadow & Trybus, 1979). Serious emotional problems are three-to-six times as common and disturbances of lesser severity are also observed with greater frequency among deaf children. Emotional/behavioral problems may be rooted in parental reactions to deafness, poor communication between parents and children, or physiological or neurological dysfunctions.

The incidence of hearing disabilities in the United States is relatively low. Less than one percent of school children are deaf or hearing impaired (Meadow, 1980). In the 1977-78 Annual Survey of Hearing-Impaired Children and Youth conducted by the Office of Demographic Studies at Gallaudet College, an estimated 67,500 hearing-impaired students were enrolled in special education programs in the nation's schools (Karchmer, Milone & Wolk, 1979). Of the more than 54,000 with complete audiological data, 44 percent were classified as profoundly deaf, 25 percent

as severely deaf, and 31 percent as less-than-severe. The etiology of deafness was related to the extent of hearing loss. Maternal rubella, hereditary factors and meningitis accounted for more than 50 percent of cases with a profound hearing loss. Mumps, infections, trauma after birth, and otitis media tended to be associated with severe or less-than-severe hearing losses.

The number of severely hearing-impaired students enrolled in higher-education programs in the United States has steadily grown from fewer than 400 in 1955 to between 6,000 and 10,000 in the 1980s (Armstrong, Schneidmiller, White, & Karchmer, 1983). Since postsecondary participation rates of deaf students are roughly equivalent to those of the general population, increased enrollments in college over the next few years due to the graduation of children deafened during the rubella epidemic of 1963-1965 are expected. Considerable strain on postsecondary resources may result.

The characteristics of deaf individuals pose important dilemmas for traditional college and graduate assessment programs. Primary among these characteristics are the language deficiencies of deaf people. Deaf individuals appear to have difficulty with such constructions as negation (e.g., not), conditionals (e.g., if, when), comparitives (e.g., greater than), inferentials (e.g., should, because), and low information pronouns (e.g., it, something) (Rudner, 1978). In addition, difficulty may be encountered with lengthy passages, unfamiliar vocabulary, or modes of communication different from the examinee's native one (Trybus & Karchmer, 1977).

Clearly, the language deficiencies of deaf students may

seriously impede the accuracy of college and graduate admissions testing. Potential problems occur in communicating directions and in measuring nonlinguistic skills, such as spatial ability, through the medium of language. For those whose native language is sign, the problem may appear to be solved by presenting test instructions and content in that mode. However, this adaptation permits no ready correction for differences in the skills of signers and the extent to which they successfully translate content. The outcome is that some students may be unfairly penalized by a poor signer and others--just as unfairly--advantaged by an overly-generous one.

The language deficits of deaf examinees may not always impair the accuracy of assessment. Success in college and graduate programs is frequently dependent upon language skills. To some extent, then, the measurement of the deaf student's linguistic competence may prove a useful predictor of accomplishment in higher education.

Visual Disability. Visual disability connotes a variety of handicapping conditions. On the one end of the continuum are totally blind individuals with no visual perception whatsoever. At the other end, those with corrective glasses may have 20/20 vision; that is, the ability to see at 20 feet what the average person sees at the same distance. Within the two extremes of visual disability are partially sighted and legally blind people. Partially sighted individuals are those whose visual acuity in the better eye with corrective lenses falls between 20/70 and 20/200. Legal blindness is defined as central vision acuity of

20/200 or less in the better eye with corrective lenses, or visual acuity greater than 20/200 if there is a restricted visual field subtending an angle no greater than 20 degrees (National Society for the Prevention of Blindness, 1966, cited in Reynolds & Birch, 1977, p. 605).

Though legal definitions for blindness and partial sightedness are useful for social security payments, income tax benefits, and other categorical provisions, they are of little value in describing the functional abilities of visually handicapped individuals for educational purposes. Although those with total blindness cannot see, between 70 and 80 percent of legally blind individuals have some measurable vision (Smith, 1982; Vander Kolk, 1981). Most partially sighted and many legally blind people differ from their totally blind peers in that they can use vision as the primary channel for learning. Although they may use large-type materials, hold a page very close to their eyes, or use a device for magnification, they can read print. In contrast, totally blind persons must use their tactual or auditory senses as the primary means of receiving information. The distinction between the ability to use vision and the need to employ alternate sensory modalities constitutes one educational definition of blindness as the inability to read print (Hallahan & Kauffman, 1978).

Historically, visually disabled persons who could use vision effectively were educated differently from those who could not. Until this century, blind children were educated in state or private schools. Many were institutionalized as wards of the state. Partially sighted individuals were more often educated in

the public schools. In recent years, the trend has been toward integrating blind children into the regular classroom using resource-teacher or itinerant-teacher strategies to provide support services (Hallahan & Kauffman, 1978).

The adaptive characteristics of blind students in college for coping with visual material are described by Smith (1982):

> By the time blind students reach college (unless newly blinded), they have probably developed various methods for dealing with the volume of visual materials. Most blind students use a combination of methods including readers, brailled books, and audio-tape-recorded books and lectures...
>
> Students may use raised line drawings of diagrams, charts, and illustrations; relief maps; and three-dimensional models of physical organs, shapes, microscopic organisms, etc. Modern technology has made available other aids for blind people including talking calculators, and speech time compressors. Paperless braille machines, braille computer terminals and reading machines are more recent devices...
>
> Most blind students who use braille prefer to take their own notes in class using a slate and stylus or a Perkins Brailler. Some students have a classmate make a copy of his or her notes using carbon paper or a copy machine. The blind student's reader later reads the notes onto tape for future use. Some blind students audio record lectures and later transcribe notes from them into braille.
>
> (p. 4)

Partially sighted students use many of the same coping strategies as blind pupils but, in addition, employ large-print materials, magnification devices, and large-print typewriters (Smith, 1982).

Much research has been done on the cognitive characteristics of blind and partially sighted students. Researchers have studied the verbal ability of visually impaired individuals over many

years, under many conditions, using a variety of tests. The accumulated evidence suggests that blind and partially sighted students possess verbal ability equivalent to that of their sighted peers (Smits & Mommers, 1976; Tillman, 1967; Vander Kolk, 1977).

Recent work has produced no clear findings that would indicate differences in cognitive functioning between adventitiously blind and congenitally blind people (Vander Kolk, 1977) or between those who are totally blind and partially sighted (Jordon & Felty, 1968). Vander Kolk (1977) concludes that blindness in itself is not intellectually handicapping.

Blind people have, however, been found to differ from sighted people on some cognitive dimensions, in particular, abstract reasoning (Tillman, 1967; Hallahan & Kauffman, 1978) and cognitive style (Witkin, Birnbaum, Lomonaco, Lehr & Herman, 1968). Some blind individuals learn words and concepts in a superficial manner without understanding the underlying meaning, a phenomenon termed "Verbalism" (Cutsforth, 1951). Such learning may be the result of the tactile sense's limitations for concept formation (Lowenfeld, 1971; Hallahan & Kauffman, 1978). Perhaps as a result, researchers have found that visually impaired children often do poorly on tasks requiring abstract thinking and are more likely to deal with their environment in concrete terms (Hallahan & Kauffman, 1978; Suppes, 1974; Nolan & Ashcroft, 1969).

Others attribute conceptual deficits in visually impaired students to a lack of appropriate learning experience. Supporting this view is the work of Friedman and Pasnak (1973)

which suggests that targeted training can increase blind children's conceptual ability to the level of their sighted peers. Many authorities now feel that the cognitive development of blind people can equal that of the general population if adequate early stimulation opportunities are provided (Schlesinger & Lee, 1980).

Relatively little research has been done on the academic achievement of visually impaired students relative to sighted pupils. That which has been conducted suggests that both blind and partially sighted children perform below their chronological age peers when matched on mental age (Hallahan & Kauffman, 1978). When time limits are extended and differentially difficult items removed, performance may equal that of the nondisabled population (Trismen, 1967).

The physical characteristic of not seeing--or not seeing well--has the potential for restricting or delaying social interaction. That delay can have consequences not only for the cognitive growth of visually handicapped people but for their social/emotional growth as well. There is a great deal of conflicting evidence about blind people's social adjustment but little data to support the position that personality problems are inherent in people with visual impairments (Hallahan & Kauffman, 1978). As with other disabilities, the adjustment problems associated with blindness may have less to do with the disability per se than with society's reaction to it.

Russell (1979) expressed the social isolation felt by many blind people:

> People separate me from the warm brotherhood of mankind, either by excessive pity or excessive admiration, and by either emotion they show that I am closed out of any possibility of ordinary relationships with them.
>
> (p. 58)

Probably the most basic response of society to the visually impaired person is to stereotype him or her into a role of dependency (Hallahan & Kauffman, 1978). Witkin, Birnbaum, Lomonaco, Lehr, and Herman (1968) noted that blind children often exhibit an excessive dependency on other people, especially their parents. Such dependency has sometimes been attributed to agencies and programs for blind individuals (Scott, 1969). Whatever the cause, dependency is a sensitive issue among college-age, visually impaired people. In a publication of the Student Division of the National Federation of the Blind (Maurer, 1975), blind college students were cautioned about dependency on special privileges:

> It is unrealistic for a blind person to say, on one hand, that he is competent and deserving of equal opportunity and, on the other hand, to accept special privileges where requirements are concerned. This implies that he is not capable of performing the same kind of and amount of work as sighted students. It is ironic, then, for a blind person who takes an extra year or more to complete his degree, or one whose transcript shows that because of blindness he could not take some of the required courses, to expect an employer to give him equal opportunity for a job. How can he expect rights without assuming the responsibility for earning those rights.
>
> (p. 6).

Evidence suggests that partially sighted people are less well-adjusted than blind people in several areas (Lowenfeld, 1971). First, mobility skills appear to be better for blind

people largely because they have the motivation to become mobile while those who are partially sighted seem to give up and become dependent (Hallahan & Kauffman, 1978; Warren & Kocon, 1974). At the college level, partially sighted students are often perceived as faking their visual problems. In addition, their writing is looked upon as childish (Smith, 1982).

About one-tenth of one percent of children in the United States are severely visually handicapped (Hallahan & Kauffman, 1978). Of the total visually impaired population, two-thirds are elderly and only 9 percent of the severely visually impaired are below age 45 (Vander Kolk, 1981). Below age 45, visually impaired males outnumber females. Blacks and other ethnic minorities are more likely than whites to have a visual disability (Vander Kolk, 1981).

Blindness tends to occur among the elderly as a result of aging or among the young who may be congenitally blind or become blind adventitiously. Congenital blindness may be genetically determined, may be caused by diseases affecting the mother during embryonic development, or may result from birth complications. Adventitious blindness may be caused by accident, injury, diabetes, cataracts, glaucoma, or infection. Currently, visual impairments coincident with other impairments are increasing. Fully half of the children with impaired vision are considered multiply handicapped (Reynolds & Birch, 1977).

The major challenges posed by the characteristics of visually impaired people for admissions testing relate to the presentation of test items and the recording of responses. Clearly, the standard paper-and-pencil format is inappropriate

for many members of this population. Alternative presentation modes, such as braille, large-type, and cassette must be employed.

In addition to changes in presentation mode, selected item formats may prove problematic for visually impaired examinees. Complex graphical representations of data, for example, must be depicted as raised line drawings. By virtue of their complexity, such drawings may be confusing unless test items requiring them are omitted or changed to include greater detail about the type and content of the drawing.

Finally, some items included in standard versions of a test may introduce difficulties for visually impaired examinees because the content area being measured requires visual capability. Items designed to assess the spatial skills needed to function in a graduate program in architecture might fall into this class. These items may be considered appropriate to the degree that similar task performance is required by the college or graduate program to which the candidate aspires.

As is true for other test modifications, the changes in presentation mode and item format often needed to accomodate the visually impaired examinee do not necessarily result in accurate assessment. Translation to braille, combined with the removal or modification of items requiring visual capabilities, may produce a test so different from the original as to prevent meaningful comparison of the resulting scores with those of the nondisabled population.

Physical Handicap. Physical handicap is sometimes used to cover the vast majority of handicapping conditions, including those already discussed. The term is here employed in a more restricted sense, excluding those with visual, hearing, and learning disabilities. Still, the group of physically handicapped people described is a large and varied one. It includes individuals with disabilities resulting from neuromuscular diseases, physical injuries, chronic health problems, and other conditions.

Neuromuscular diseases, such as cerebral palsy, epilepsy, poliomyelites, muscular dystrophy and multiple sclerosis may be generally characterized by weakness, clumsiness with voluntary motion, or troublesome involuntary movements. Mobility may be impaired and, in severe cases, a wheelchair may be necessary. In addition to mobility impairment, there may be symptoms of brain injury: impairments of intellect, learning ability, verbal skills, form and space perception, or motor coordination (Corcoran, 1981).

Cerebral palsy (CP) is a disability of the motor centers of the brain occurring before or during birth and manifesting itself in muscular incoordination and speech disturbances. The most common forms are ataxic, shown by marked inability to coordinate bodily movements; athetoid, appearing as slow, repeated movements of the limbs; and spastic, characterized by abrupt contractions of muscles producing interference with and distortion of movement (Reynolds & Birch, 1977). Some individuals with CP walk well, others use braces or crutches, and some require a wheelchair. Sometimes the speech and mouth muscles are affected so that words

sound garbled and verbal communication is impaired. Additional complications can include visual or auditory impairment, seizures, degenerative joint disease, respiratory infections, and fatigue (Easton & Halpern, 1981). The mean IQ of cerebral palsied children is well below the average for the general population (Cruickshank, Hallahan, and Bice, 1976). However, some individuals with CP have normal intellectual ability and a few test within the gifted range (Hallahan & Kauffman, 1978). Cruickshank (1976) estimates the childhood prevalence of cerebral palsy at .15 percent of the population, with over half of that group being male.

Epilepsy is a convulsive disorder in which recurrent seizures are caused by an abnormal discharge of electrical energy in the brain. Hallahan and Kauffman (1978) describe the traditional classifications of epilepsy as grand mal, focal, Jacksonian, and petit mal. The usual grand mal seizure involves a diffuse, quickly spreading electrical discharge which manifests itself by a cry, a loss of consciousness, a short period of muscle rigidity, and a period of involuntary muscle contractions of the extremities, trunk, and head. Focal seizures involve a fairly circumscribed part of the brain and may cause sensory or psychomotor manifestations. Jacksonian seizures produce rhythmic twitching in one area that may spread to the whole body. Petit mal seizures are characterized by brief lapses of consciousness lasting from one to 30 seconds. Although petit mal seizures are less severe than others, they may occur more frequently, in some cases as often as 100 times a day. Most of those with epilepsy

function normally between seizures and many have average or above intelligence (Dickman, Matthews, & Harley, 1975). Epilepsy can generally be controlled with medication although the medication itself, if required in large amounts, may affect coordination, vision, attention, and memory (Ward, Fraser, & Troupin, 1981). Normal social/emotional development of epileptic children may be hampered by the social stigma of the condition (Arangio, 1975). Estimates of the prevalence of epilepsy range from .5 to 1 percent of the population (Hallahan & Kauffman, 1978).

Multiple sclerosis (MS) is a common neurological disease affecting as many as 500,000 persons in the United States. Kraft (1981) describes it as a disease which attacks the myelin sheath of the nerve fibers in the brain and spinal cord. Where myelin is destroyed, plaques of hardened tissue (sclerosis) occur in many places. The lesions of MS can therefore cause almost any type of central-nervous-system symptom: impaired sensation, lack of coordination, double vision, slurred speech, memory loss, spacticity, or paralysis of the extremities. The disease is progressive but unpredictable. Some MS individuals are never severely incapacitated, others suffer exacerbations and remissions, while in perhaps 10 percent of cases there is severe and rapid deterioration. The combination of weakness, spasticity, ataxia and tremor may interfere with walking and necessitate a wheelchair for mobility.

Poliomyelitis is an infectious disease which attacks the nerve tissue in the spinal cord and/or brain, sometimes leaving the individual with severe muscular weakness, spasticity, paralysis, or skeletal deformities (Hallahan & Kauffman, 1978).

Since the Salk vaccine was perfected in the mid-1950s, poliomyelitis has been virtually eliminated in the United States, although those disabled by polio are still encountered at the college level (Ragosta, 1980) and in vocational rehabilitation settings (Stolov & Clowers, 1981). Although polio does not affect intelligence directly (Hallahan & Kauffman, 1978), cognitive development may be slowed by reduced opportunities to learn.

Hallahan and Kauffman (1978) describe muscular dystrophy as an hereditary disease characterized by progressive weakness caused by degeneration of muscle fibers. There are two major types: Duchenne and Landouzy-Dejerine. The former affects only boys whose muscles become replaced by fatty tissue and who seldom live beyond adulthood. The latter form of the disease affects both males and females, some of whom become totally disabled while others live a relatively normal life. The major effects of muscular dystrophy are associated with physical mobility and the prospect of early total disability or death. The disease itself does not directly affect intellectual functioning, though it may limit learning opportunities.

In addition to neuromuscular diseases, the second major category of physical disability is injury. Orthopedic disabilities may result from amputation of limbs or injury to the spinal cord. In cases where amputation has resulted in the loss of arms or legs, prostheses may be prescribed or alternate methods of accomodation found.

Injury to the spinal cord frequently results in paralysis.

Paralysis restricted to the lower half of the body is called paraplegia. That involving both arms and both legs is termed quadriplegia. Capabilities of spinal-cord-injured individuals vary widely depending on the location of the lesion along the spinal cord. Overall functional ability depends upon the level of lesion and the residual muscle function, the extent and success of adaptation and rehabilitation, psychological adjustment, and general health and ability level (Donovan, 1981). Mobility impairment is characteristic of spinal cord injuries, and modifications such as braces and wheelchairs provide the primary means of adaptation. Since spinal cord injury or loss of limbs does not affect the cognitive processes directly, cognitive development is hampered only by restricted opportunities to learn.

The proportion of orthopedically disabled students in the handicapped college freshmen population is reported by Lawrence, Kent, and Henson (1982) to be 22 percent. The orthopedic disability was likely to have been diagnosed either prenatally, at birth, or after age 12. One-third of the orthopedically disabled students regarded their handicap as visible; however a larger-than-average proportion indicated that their disability did not affect their general college functioning. Orthopedically handicapped students were more likely than the average handicapped student to use support services and accomodations designed to enhance mobility, but to indicate that instructional accomodations were irrelevant to them. Orthopedically disabled pupils were underrepresented in public and private four-year colleges and were somewhat more likely than average to have

entered public two-year colleges in 1978. At the time of follow-up, 73 percent were currently enrolled in college and 44 percent had achieved senior status. Females outnumbered males 3 to 2.

Chronic health problems, the third major category of physical disability, includes cardiac conditions, severe allergies, cancer and other difficulties which impair the well-being of individuals. In a recent study of 41 disabled student service programs, Scales (1983) found students with chronic health problems to constitute 17 percent of the 9,000 students served. Lawrence, Kent, and Henson (1982) found those with health-related disabilities to compose 10 percent of their follow-up study sample. Students with health-related disabilities were almost twice as likely as the average handicapped student to have dropped out and reenrolled in college during the three-year study period, but were no less likely to be seniors. Their health-related disabilities tended to be diagnosed either at birth or after 18 years of age, and to be hidden. Eighty-four percent reported functional impairments that were likely to be evident in social and recreational situations.

This brief summary of diagnostic categories makes clear the wide range of conditions that fall within the category of physical disability. The physical characteristics of this group are dependent on the specific disability, its onset, course (whether it is permanent or temporary, chronic or acute, cyclical, degenerative, etc.), severity, and the individual's adaptation to it.

The cognitive development of physically handicapped people

varies significantly both across and within diagnostic categories. Cognitive development may be slowed by reduced opportunities for normal interaction and development or by the effects of neurological involvement. Medication may also negatively affect academic performance. In many cases (e.g. for orthopedic disabilities), the impairment will not directly affect the cognitive processes.

The major problems encountered by physically handicapped young people are typically social (Hicks, 1978). For physically handicapped as well as for other disabled persons, opportunities to interact with others are restricted. Social and cognitive development may be impaired because of that restriction rather than as a result of the disability per se. Parents, or residential institutions serving in loco parentis, may overprotect and unduly limit the activities of handicapped children. The attitudes of family members and friends are critical for self concept, but the attitudes of the general public also have a strong influence on social development.

In a review of research, English (1977) presented information on the attitudes of nondisabled people toward those with disabilities. The review suggested that nearly half of all nonhandicapped people have negative attitudes toward physically disabled individuals. English's review also suggested that in a social context there is an "aesthetic" factor related to appearance which influences the social and personal preferences of nondisabled persons for the disabled. In an occupational context, however, nondisabled employers appear to choose disabled persons in terms of their functional abilities or productivity

rather than appearance. Persons who are orthopedically handicapped (e.g., amputees and paraplegics), are generally preferred as workers over persons with sensory disabilities (e.g., deaf or blind persons), who in turn are more generally preferred over those with brain-related disabilities, (e.g., the mentally retarded).

The incidence of physical handicaps in postsecondary students appears high relative to visual or learning disabilities. In a recent study of disabled student service programs, Scales (1983) found paraplegic, quadraplegic, semi-ambulatory, and chronically health impaired students to constitute over half of the known handicapped student population.

The challenges posed by those with physical handicaps for college and graduate admissions testing programs are generally less severe than those posed by other disability groups. For physically handicapped examinees, some of the more frequent problems encountered relate to the recording of responses and to fatigue. To assist those lacking the physical capability needed to complete a machine-scorable answer sheet, an amanuensis (i.e., a person who records responses) is typically provided. The problem of fatigue is addressed by allowing extra time to complete sections of the test and longer or additional rest periods between sections.

Research Issues and Activities

As the preceding review has indicated, the characteristics of handicapped people frequently differ in important ways from those of the general population. Differences are found in

physical, cognitive/academic, and social functioning. Many of these differences raise important issues for admissions testing. In this section, four such issues and the research activities designed to address them are discussed.

Is the Admissions Testing Process Accessible to Handicapped People?

The concept of access extends to several elements of the admissions testing process. For one, handicapped students must have access to information about the nature of the different special arrangements if they are to choose the accommodation best suited to their needs. In addition, they must understand that special accommodations result in flagged scores with unknown meaning. The extent to which handicapped high school students have access to this basic information is an open question (Ragosta, 1980).

A second element of access relates to physical admittance to the testing environment. Some handicapping conditions, in particular visual impairment and physical disability, can make movement in the testing environment difficult. To facilitate movement, such modifications as ramps and wide doors for wheel chair access, bathrooms with wide stalls and railings, and elevators with braille floor selections should exist.

To learn more about the problem of access, the College Board/ETS/GRE Board research program will survey handicapped candidates taking special administrations. This study should provide insight into the degree to which these students had access to accurate information and sound advice about special accommodations. It should also offer information on the physical

accessibility of admissions testing facilities.

Is the Content of Admissions Tests Fair to Handicapped Examinees?

Much of the concern expressed over admissions testing and handicapped people has revolved around the possibility that tests are unfair to disabled students. One way in which tests can be unfair is when the measurement of relevant abilities is confounded with irrelevant ones. For example, the language in which mathematics word problems are presented may include vocabulary or syntax that is more difficult for deaf than hearing students. Scores resulting from such a measure could present a distorted, or unfair, picture of the deaf student's mathematics ability.

To address the possibility of content bias in admissions tests, two studies will be conducted. The first study will examine the fairness of tests through an analysis of the way in which test items relate with one another. Different relational patterns in handicapped versus nonhandicapped groups suggest that the test is measuring different abilities in the two populations--as when the same mathematics-word-problem test measures math ability in the general population and linguistic proficiency in deaf examinees. Such a finding would support an inference of bias in admissions tests.

The second study will examine the behavior of individual test items. When a test is functioning equivalently across groups, members of different groups achieving the same average total test score should perform equally well on the individual

items that compose the test. Decreased performance on an individual item suggests that the item is not measuring the same ability in both groups. The results of such an examination of item bias should help identify item formats and content that may be unfair to handicapped students. In addition, it should help to explain differences in the relational patterns of items discovered through the first bias study. Finally, the results of both studies should provide a better understanding of how bias can be avoided in future tests.

Do Admissions Tests Predict Academic Success Equivalently for Handicapped and Nondisabled Populations?[3]

The predictive characteristics of admissions tests can be discussed in terms of predictive efficiency and predictive meaning. Predictive efficiency can be thought of as the strength of the relationship between the test and the outcome it is meant to predict--for example college freshman grade point average (GPA). The strength of this relationship is important because it is directly related to the dependability of the inferences that can be based on test scores. The stronger the relationship between test score and college success, the more dependable the inference that a student with a particular score will succeed in the academic program.

Questions of predictive efficiency are relevant to admissions testing and handicapped people because differences in predictive power may exist. The existence of such differences implies that test scores be weighted more or less heavily depending upon the direction of the difference. A finding that the scores of handicapped examinees are generally less predictive

than those of the larger population would suggest that less weight be given the test scores of handicapped students in admissions decisions.

Differences in predictive power may manifest themselves in several ways. Differences may exist between handicapped and nondisabled groups. Differences may also exist among handicapped groups, as when a test predicts academic success better for physically disabled than for deaf students. Differences may occur among test modifications. For example, a large-type version may prove a more powerful predictor for those with learning disabilities than a cassette version. Finally, group-by-modification combinations may evidence differential power. Cassette with extra time may be the best predictor for visually impaired pupils, while the standard paper-and-pencil administration without added time proves best for deaf examinees.

A second predictive characteristic of admissions tests is meaning, or the extent to which over- or under-prediction occurs. In the admissions context, predictions of academic success are based upon equations that summarize the relationship between predictors--such as tests and high school average--and indices of future performance. These equations are used to generate an estimate of expected achievement upon which the admissions decision for an individual is partially based. Over- and under-prediction occur when the prediction equation derived from the general population systematically predicts different performance on the criterion than is actually achieved by subgroup members. For example, it may be the case, that a 500 on the Verbal scale

of the Scholastic Aptitude Test promises a B+ average at a particular institution for most students. For handicapped examinees, however, the same 500 may be associated with a higher GPA. In such a case, handicapped students would be disadvantaged by using the equation for the nondisabled population; their performance would be under-predicted.

As is true for predictive efficiency, differences in predictive meaning can manifest themselves in several ways. Differences can occur for handicapped students generally--as when admissions tests, regardless of the modification, under-predict GPA for all disabled students. Differences can occur for a single diagnostic group such as deaf students, or for a specific test modification--as when extra time over-predicts the performance of those students utilizing it, regardless of handicap. Finally, under- and over-prediction can be associated with different group-by-modification combinations. Cassette may over-predict the grades of learning disabled students but under-predict those of visually impaired examinees.

The possibility of differences in predictive meaning and efficiency is of obvious importance to those using test scores in admissions decisions. To provide more information about the existence of these phenomena--and the consequent validity of admissions tests for the handicapped--two sets of studies will be conducted. The first set of studies will be conducted at a variety of institutions so that variations in efficiency and meaning can be detected. The second set will attempt to aggregate validity results across institutions so that general conclusions about predictive validity can be reached.

Can the Preadmission Identification of Disabled Students Taking Modified Admissions Tests be Avoided?

The characteristics of handicapped students necessitate modifications in the admissions testing process. The introduction of these modifications affects the meaning of the resulting test scores in unknown ways. Admissions officers and disabled students are warned of this fact by the "NON STD" notation placed on score reports. Though letting admissions officers know that the accompanying scores may not be an accurate reflection of developed ability, the notation constitutes a violation of the preadmission inquiry provision of Section 504.

Several possibilities exist for defensibly eliminating the "NON STD" designation. The most desirable circumstance would be a finding that scores from modified administrations are comparable to those from standard ones. To fully meet this criterion, several technical issues would need to be examined to ascertain the effects of nonstandard administrations. At the least, scores from modified formats would need to have predictive efficiency and meaning similar to that of the standard test. Given the large number of subgroup-by-format combinations, even this condition may not always be met, though it may hold true for some combinations, formats, or subgroups.

One possibility for eliminating the flagging of scores was recommended by the NRC Panel on Testing of Handicapped People (Sherman & Robinson, 1982, p. 117-118). The NRC Panel suggested using college grade point average as a means of adjusting test scores to correct any systematic over- or under-prediction of the

college performance of disabled students. This adjustment may have unintended consequences. Those with learning disabilities, for example, are characterized by definition as underachievers--that is, individuals whose ability test scores suggest levels of ability higher than actually realized in academic achievement. If this relationship holds up at the college level, the effect of scaling admissions scores according to college GPA would be to lower the ability test scores of LD students as compared to current levels.

The reseach program will include an analysis of the conceptual underpinnings and operational requirements of the scaling technique proposed by the NRC Panel. If the technique is found to be feasible, an empirical assessment of the procedure will be undertaken.

Summary

This paper has presented a research context for college and graduate admissions testing and handicapped examinees. The paper first traced the development of the research program undertaken by the College Board, ETS, and the Graduate Record Examinations Board to Section 504 of the Rehabilitation Act and to the NRC Panel on Testing of Handicapped People. Next, information on the definition of handicapping conditions and characteristics of handicapped individuals was presented. Finally, four issues central to testing handicapped people for admissions purposes were discussed and the research activities designed to address those issues were identified.

The context constructed by the paper is by no means a simple one. Complex problems were identified with respect to

definition, characteristics, and testing. These problems will necessarily constrain research efforts. For example, it will not be possible to gather information on the predictive efficiency and extent of over- and under-prediction associated with the SAT for all group-by-modification combinations; too many such combinations exist.

All the same, the data gathered through research should greatly increase our knowledge of admissions testing and handicapped examinees. With the continued efforts of colleges and universities, testing agencies, and handicapped people themselves, improved practices in admissions testing should result.

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Footnotes

1. Special administrations of the SAT have been offered by the College Board for at least forty-five years (Saretsky, 1983). Work on the first braille version of the test was begun by Carl Campbell Brigham in 1937 at the request of the New Jersey Commission for the Blind, with the support of the American Foundation for the Blind. The first versions of the test were offered in 1938 to seven visually impaired candidates in both braille and large type. Candidates had the option of taking the Paragraph Reading section of the test by means of long-playing records and recording responses by typewriter or dictation. Extended time was also allowed.

2. The proportions reported should be viewed with caution. Lawrence, Kent, and Henson (1982) report substantial inconsistency in disability self reports for the same individuals between 1978 and 1981. In addition, the large number of other (13%) and unknown (27%) responses reported by the 1978 sample suggest the possibility that the 1978 data misrepresent the true distribution of handicapping conditions in the freshman population.

3. It should be noted that this question--and the ensuing discussion--can also be applied to high school GPA. That is, does high school GPA predict academic success equivalently for handicapped and nonhandicapped populations?